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Paper No. 229, 1888, says: "This acquisition renders the collection at the Museum of ancient cave remains the most complete that is known to archæologists."

I visited the Kensington Museum and the Museum of Natural History, now presided over by Prof. W. H. Flower. Prof. Flower was president of the British Association at Newcastle this year, and his address was devoted to the organization of museums so as to produce the greatest benefit for students and for the public.—*Thomas Wilson.*

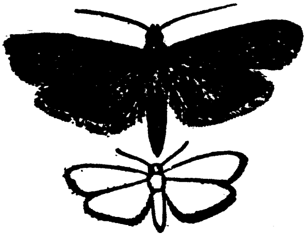
ENTOMOLOGY.

The Flour Moth.—A new insect pest has recently made its appearance on the continent of America. It is known as the flour moth (*Ephestia kuhniella*), and its ravages, as its name indicates, are seen in the destruction of flour, in which it weaves its webs, and upon which the caterpillar feeds. As it is very destructive, and increases with marvelous fecundity, it is of the utmost importance that every precaution should be taken to prevent its spread.

The flour moth is indigenous to the Mediterranean, and a few years ago it would have been likely to stay there. But increasing commerce has its attendant dangers. Experience has shown that as trade in the milling industry enlarges, weed and insect pests, confined at one time to a certain locality, have spread to places far distant. The flour moth has probably come to America with importations of seed wheat, or in bags in which flour has been exported, and which before their return may have been stored for a time in some place infested by the insect.

The color of the fore-wings of this moth may be generally described as of rather pale gray, with darker transverse markings. The hind wings are peculiar for their whitish semi-transparency, with a darker line from the point along a part of the fore edge. The accompaning illustration will convey a general idea of the appearance of the moth.

An examination of the flour infested by the insect shows a mass completely spun together with the web. Giving the result of his investigations, an expert tells us he found it so matted together that, after pulling some lumps of it away, he found that the rest hung down in rag lumps or clots, so felted together that little flour remained in a loose state. From a mass of these clots, containing two or three cubic inches, only a teaspoonful of flour could be obtained by repeated shakings. The mass was filled with live caterpillars, living and dead chrysalids, and remains of dead moths. Going on to describe the appearance of these caterpillars, he says:


(a). Moth (imago) magnified.
(b). Outline, showing natural size.

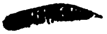
Moth (imago) slightly magnified; sessile or quiescent.

Caterpillar (larva), natural size.

"The caterpillars varied in size from two-eighths up to five-eighths of an inch in length, and correspondingly in color, the younger ones being of flesh or pale red color, and the largest almost white; the shape cylindrical, somewhat slender, with sixteen feet,—that is, three pairs of claw-feet, four pairs of sucker feet, and a very well-developed pair besides beneath the tail, by the help of which, although the largest of the larvæ were sluggish, the younger traveled nimbly, and could move backwards or forwards at pleasure, or were able to attach themselves at once to a foreign substance, as the finger or hand. The head yellowish brown, darker in front, and with dark brown jaws; a transverse patch on the segment next the head, this rather pale yellowish brown, with a faint pale central line dividing it from back to front, and (in the oldest specimen) a small brown spot on each side of the segment below the patch. Along the back, excepting towards the head and tail, were four small dark dots on each segment above, two on each side the centre. On the segments near the head the spots were arranged more transversely, and at the tail, immediately above the sucker-feet, was a brownish, oval or somewhat triangular patch (the anal plate). On the preceding segment one transverse row of spots varied somewhat in different specimens; the largest was in the middle, with a smaller one on each side, occasionally one below, which would make five altogether; but sometimes the lowest pair was absent, sometimes the middle large spot was not entire; conjecturally the marking differed with the age of the caterpillar. On the preceding, that is, the eleventh segment, there were two clearly defined brownish spots, and along each side of the caterpillar was a row of dark dots, one on each segment.

"The caterpillar was slightly sprinkled with pale hairs or fine bristles, and had such a capacity for catching and retaining a covering of flour that I was obliged perpetually to remove it with the moistened tip of a finger to obtain a clear view of the markings.

Chrysalis (pupa), natural size, but stripped from the film of flour surrounding it.



Cocoon as it appears in most instances.

"The chrysalis, which was lying in a silken cocoon of spun-up flour, showed the chief points of the form of the coming insect plainly—the color bees-wax below, shading to reddish-brown on the back, and reddish-brown also at the end of the somewhat prolonged, slightly-curved tail, which ended bluntly or cylindrically; the eyes of a darker shade of red. There were remains of dead, partly developed moths or chrysalids in the box, but I could not make sure whether, as thought not unlikely by Professor Zeller, these had been destroyed by their caterpillar brethren—the size and power of their jaws make the cannibal habit appear very probable. I had not opportunity of observing how long the chrysalis state lasts before the moth appears from the chrysalis condition, but this time is given by Professor Zeller as three weeks."

From all that can be learned of the habits of this insect it would appear that it is unceasing in its ravages where the temperature is suitable, in fact that it is an all-the-year-round pest. The pupa stage being short, its multiplication is very rapid. How rapid is shown by the fact that a large warehouse, 75 feet long, 25 feet wide, and four stories high, became literally alive with moths in the short space of six months, while thousands of cocoons were found adhering to the walls, ceilings, and joists, and in every crack, crevice, and nail-hole, necessitating a thorough cleansing of the entire building and its contents, the burning of a great deal of the wood-work, and the disinfecting of the whole place to destroy any germs that might possibly have escaped.

The first appearance of the flour moth in Canada that I can learn of was in March, 1889, when it was observed in a mill in Ontario. Little attention was paid to it, as its dangerous character was not known; but by and by the moths began to appear in greater numbers, and soon small worms were observed in the flour. Alarm began to be felt, and it was suspected that these worms came from the moths which had been seen in the mill. In July the bolting cloths, elevators, and some other parts of the machinery, were carefully cleaned and washed. In about four days after starting again, the bolts, elevators, etc., were found to be in a worse state than ever, full of webs, moths, and worms. The mill was shut down and a more thorough cleansing set about. But it was found that every crack and crevice was alive, and as the character of the moth was entirely new, an application was made to the Government for assistance. A number of visits were made to the infected mill by the authorities, and an order in council was passed by the Government ordering the Provincial Board of Health for Ontario to suppress the pest. The machinery was taken down and thoroughly steamed; the building was swept and subjected to the fumes of burning sulphur; the loose wooden parts, such as elevator spouts, etc., were burned, and paper bags, boxes, and any goods suspected of being infected, were similarly disposed of. Even the mill-stones and iron rollers were thoroughly steamed by placing them in a tight box with a pipe from the boiler. After about two months' loss of time, and a large outlay for new machinery, stock, etc., the mill was pronounced free from infection and ready to go to work again. As may be supposed, its proprietors have taken such precautions as will prevent the pest gaining a footing should it again make its appearance. They have provided a steam stand-pipe, with hose leading to each flat of the mill, so that live steam can be turned on sufficient to kill anything.

The importance of dealing promptly with the Flour Moth whenever and wherever it appears, has led the Ontario Government to issue a bulletin, in which the following precautions are suggested to prevent its introduction, and means of eradication pointed out should it appear: (1) no milled goods, such as Italian semolina, Indian cassava, and Brazilian tapioca, should be allowed to enter the country, especially from Mediterranean ports, without being quarantined in a warm place for a number of months, so as to give time for the ova, if present, to hatch; (2) all bags used for transporting flour, meal, or grain should be prevented from entering the country till they have been thoroughly boiled or steamed so as to kill any germs; (3) millers, exporters and importers of flour or grain should familiarize themselves with the appearance and habits of the moth at its various stages, and take measures to destroy individual specimens before they have time to multiply. Should the pest have made its appearance the following measures are recommended: (1) Destroy the moths by closing all apertures and burning sulphur night after night in all parts of the building; (2) search for the larva or caterpillar in all packages of flour and meal, and if any are found superheat in a dry kiln by spreading it out in a thin layer so the heat can reach all parts; (3) do not under any circumstances sell infected flour to dealers, but have it steamed and fed to hogs; (4) where webs are found it may be considered that the larva has reached the chrysalis stage, and the cocoons, or little masses of flour glued together, being little rolls about three-quarters of an inch long, should be gathered up and burned. It must be remembered, however, that the larva has a habit of retiring to some crevice where it may be impossible to reach it, in which case watch should be kept for the moths as they emerge from the chrysalis, and they should then be killed. In such case sulphur fumes should be used. When the larvæ have gained possession of any part of the machinery, superheated steam must be used.

Where the use of sulphur might be attended with danger, chlorine fumes may be used with equal benefit. Infested places may also be sprayed with a solution of corrosive sublimate, consisting of one drachm to each gallon of water, or with a soap emulsion consisting of two gallons of kerosene, one of water and half a pound of whale oil soap. The solution of soap should be heated and addded boiling-hot to the kerosene, and then thoroughly mixed by means of a force-pump and spray-nozzle. One part of this emulsion should be used with nine parts of water. Prof. Riley, who gives the above formula, lays great stress upon having kerosene properly emulsified when used as an insecticide.

By adopting the above precautions this pest, which if allowed to go on unchecked soon becomes worse than any of the plagues of Egypt, may be kept down. The prompt measures already taken have to all appearance stopped its spread in Canada, but it is liable to appear again at any time. It has been seen in the United States but does not appear to have done any mischief. With the intimate trade relations which exist between the two countries its spread in one would soon be followed by its appearance in the other. Eternal vigilance is the price of freedom from its ravages, and attention having been called to it, millers and others likely to suffer should be on the alert.—J. J. Bell, *Brockville, Canada.*